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**Resource Bulletin
RM-14**

Net Economic Value of Waterfowl Hunting in Idaho

Cindy F. Sorg and Louis J. Nelson

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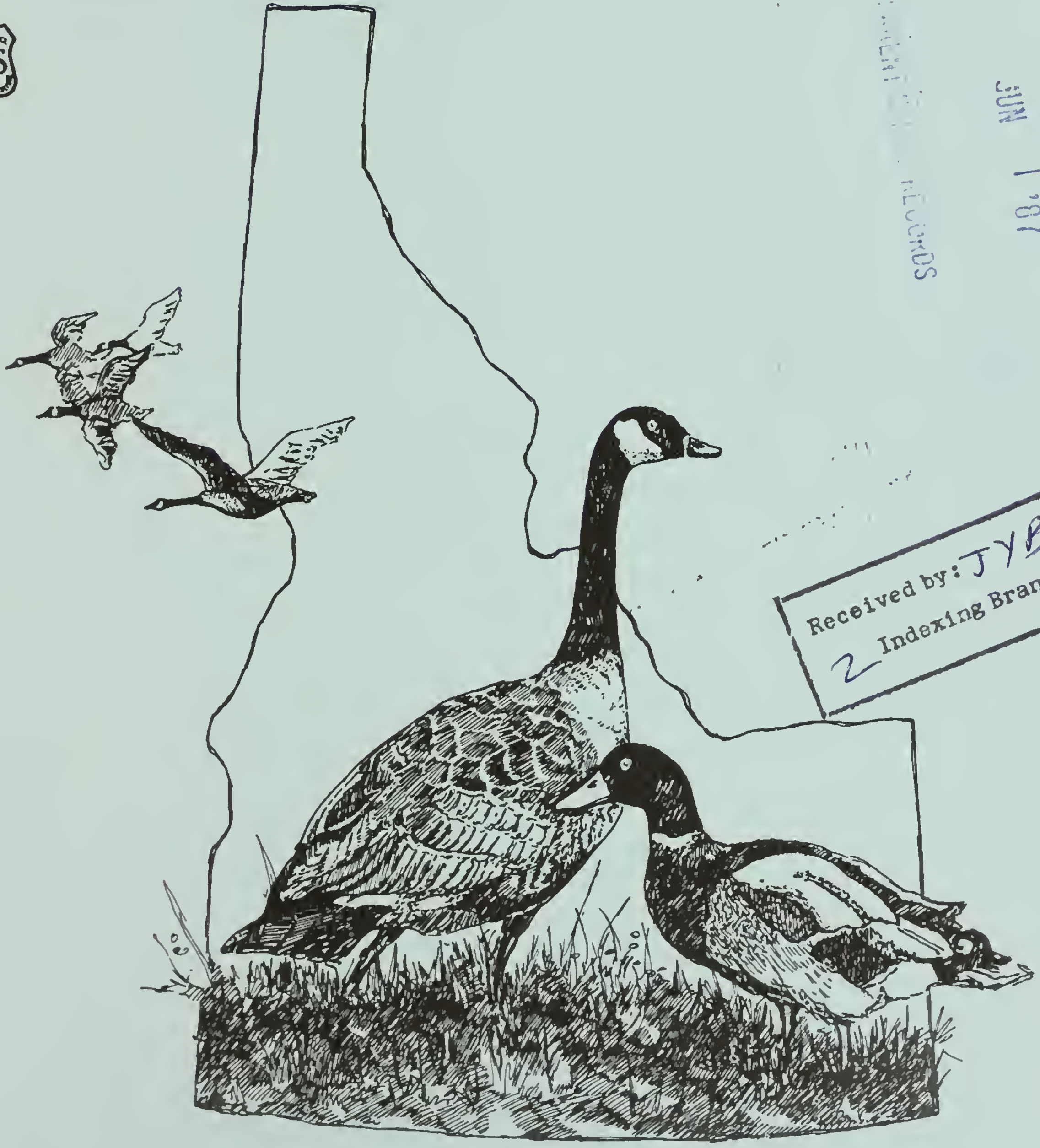

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Abstract

Average net willingness to pay for waterfowl hunting in Idaho was estimated at $22.25 per trip and $32.79 per trip, using the Travel Cost Method with a standard cost per mile and a reported cost per mile, respectively. Using the Contingent Value Method, a net value of $16.87 was estimated for the last trip of the season. Willingness to pay was greater for double the number of opportunities to shoot. Methods, results, and applications are fully described.

Acknowledgement

This study was a cooperative effort of the Idaho Department of Fish and Game; the University of Idaho College of Forestry, Wildlife, and Range Sciences; the USDI's Bureau of Land Management and Fish and Wildlife Service; and the USDA Forest Service.

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Net Economic Value of Waterfowl Hunting in Idaho

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Cindy F. Sorg and Louis J. Nelson

MANAGEMENT IMPLICATIONS

That wildlife recreation has economic value is indisputable, but estimates of this value are difficult to establish. In part this is due to different definitions of economic value and to differences in techniques used to estimate economic value. This bulletin analyzes the value of waterfowl hunting in Idaho, using both estimates of consumer surplus (net willingness to pay of the user) and expenditures as components of total value for consumptive use of the waterfowl resource. Values derived from nonconsumptive use are neither estimated nor included.

Management of the 27 species of waterfowl found and hunted in the State of Idaho is restricted by two factors: (1) availability of water and wetland habitats, and (2) federal guidelines set by the USDI Fish and Wildlife Service. Benefit-cost analyses for federal and state wildlife planning programs, such as the Forest Service's FORPLAN and the Bureau of Land Management's SAGERAM, involve determining whether the benefits of implementing a project exceed the cost of the project. If the benefit-cost ratio is greater than 1, then the investment is economically efficient.

In 1982, the net economic value of an Idaho waterfowl hunting trip to the hunter and to the Nation was estimated to be $22.25. This means the typical hunter would be willing to pay an additional $22.25 per trip over current expenditures. The gross value is the sum of the $39.00 of expenditures (transportation, lodging, food, ammunition) plus the consumer surplus of $22.00, which equals $61.00 per trip. This value is a state average from which can be derived per day or per 12-hour Wildlife and Fish User Day (WFUD) values. Actual forest planning or project related analyses (environmental assessments) should use the appropriate individual site values rather than the state average.

Because of the statistical properties (functional form) of the demand curve estimated for waterfowl hunting, the site average value equals the marginal value of another trip. That is, the additional net value to the hunter and society of another trip is equal to the average value of a trip. This result holds only because of the specific functional form used in this study. For project level analysis, the marginal value is the appropriate measure; however, in this case the average and marginal values are equal. See the appendix for a discussion and proof.

If the decisionmaker is evaluating the economic benefits of alternative investments in waterfowl management, then the net value of $22.00 per trip is the appropriate value to use per trip. This value is derived by a demand curve estimation technique called the Travel Cost Method (TCM). This approach statistically infers the bid that hunters would make if given the opportunity to express willingness to pay.

The Contingent Value Method (CVM) was also used in the study to elicit simulated market bids from hunters. This approach was used to measure the value of the last trip taken during the season. The per trip value obtained using the CVM was $16.87.

The information on hunter expenditures is useful for evaluating the impact on communities dependent upon tourism, but it is not a measure of economic value to the waterfowl hunter. Much like the harvesting and transportation expenditures of logging, hunter expenditures can be used in input-output models such as IMPLAN or BREAM to calculate the multiplier effects of expenditures on local income and employment. However, for efficiency analyses, an overall consumer surplus value, such as willingness to pay per trip, would be more tenable than expenditure values.

INTRODUCTION

The economic value of wildlife as measured from the national or economic efficiency view is used in federal land management planning by the USDA Forest Service and USDI Bureau of Land Management. While the land, habitat, and general hunting regulations are managed at the federal level, the wildlife itself is the property of individual states. Coordination of economic value of wildlife is necessary if federal plans affecting habitat are to be compatible with the state plans for management of individual species.

Specifically, the average net willingness to pay for waterfowl hunting in the State of Idaho will be reported here. These values should prove useful in national forest planning, BLM range-wildlife investments, Resource Planning Act evaluations of the USDA Forest Service, and in feasibility studies of investments to enhance waterfowl hunting in the State of Idaho.

This study also served as a test of the cost effectiveness of using the Travel Cost Method and the Contingent Value Method for developing Resources Planning Act (RPA) values for the 1990 RPA to be conducted by the Forest Service.

DEFINITION OF ECONOMIC VALUE

Wildlife resources, in this study waterfowl, provide for many values. Expenditure information is useful in answering questions about the impact on local communities of hunting or fishing in the area; it does not, however, represent the economic value of wildlife. The many components that make up economic values include recreational, option, existence, and bequest values. Recreational economic value is the recreationist's willingness to pay over and above current expenditures for such activities as hunting, fishing, wildlife photography, and wildlife viewing. Option value is willingness to pay to maintain a resource so that it is available for future use. Existence value is the economic benefit received from simply knowing wildlife exists regardless of one's use. Bequest value is an extension of existence value since it is willingness to pay to provide wildlife resources for future generations. Depending on the species of interest, the magnitude of each value component will vary.

The waterfowl values reported here capture only the general hunting aspect of recreation value. The other components of recreation value were not measured in this study or in any other known study; therefore, no judgment can be made as to the percentage of total waterfowl value captured in this study.

TECHNIQUES FOR MEASURING NET WILLINGNESS TO PAY

Dwyer et al. (1977), the U.S. Water Resources Council (1979, 1983), Walsh (1983), and Knetsch and Davis (1966) all recommend the Travel Cost Method (TCM) and the Contingent Value Method (CVM) as conceptually correct techniques for empirically estimating users' net willingness to pay. The TCM relies on the assumption that travel costs can be used as a proxy for price to derive a demand curve. The CVM asks users directly to indicate their willingness to pay.

Travel Cost Method (TCM)

The basic premise of TCM is that per capita visitation of a recreation site will decrease as distance to the site and time costs of travel to the site increase. In this study, a Regional Travel Cost Model (RTCM) was constructed. Grouping of individuals based on county (or state) of origin makes travel costs (and distance) within each county/state zone approximately constant across all individuals. The dependent variable is trips per capita. Use of the per capita specification adjusts for population differences between counties of visitor origin. As Brown et al. (1983) show, trips per capita takes into account both the number of visits as a function of distance and the probability of visiting the site as a function of distance. Regression analysis is utilized to estimate a function for visitation rates based on distance and socioeconomic data. Johnson et al. (1981) described a general functional form:

$$V_{ij} = \alpha_o + \alpha_1 D_{ij} + \alpha_2 S_{ij} + \sum_k \beta_k E_{ki} + \Sigma \gamma_1 Q_{1j} \qquad [1]$$

where

V_{ij} = annual per capita visits to hunting site j from origin i

D_{ij} = distance from origin i to site j

S_{ij} = recreational hunting opportunities available to population of i as alternatives to site j (substitute sites)

E = demographic/socioeconomic variables for origin i

Q = variables of recreation hunting quality at j.

Equation [1] specifies the per capita demand curve for the hunting sites in the region. By setting the quality measure at a value associated with a specific site, the RTCM demand curve becomes the demand curve for that specific site. Thus, with one equation one can model recreation visitation patterns for all sites in the region. From the per capita demand curve a second stage demand curve is calculated. This second stage demand curve plots total trips to a site as a function of hypothetical added distances. Once the hypothetical added distance is converted to travel costs (in dollars), the area under the second stage demand curve represents net willingness to pay. It is net willingness to pay because only the hypothetical added cost is reflected in the second stage demand curve, not the original travel costs. For a complete discussion of the Travel Cost Method, see Clawson and Knetsch (1966) or Dwyer et al. (1977).

The estimate of net willingness to pay is the end result of a series of mathematical and statistical operations on the aggregated data. One item of interest about estimated net willingness to pay is the sensitivity this estimate exhibits in response to variation within the Travel Cost Model. This variation is initially seen in the computed statistical confidence interval associated with the estimate of each coefficient of the visits per capita regression model. Conceptually, this variation is carried through all the steps described above, including formation of the second stage demand curve and the subsequent integration under it. Thus, it is logical to talk about variation associated with estimated net willingness to pay. (Sensitivity intervals are discussed in the appendix.)

Contingent Value Method (CVM)

Contingent Value Method techniques are most commonly referred to as bidding games. Unlike the familiar market situation where people alter consumption in response to price changes, bidding games ask individuals to respond to discrete changes in a nonmarket good. Usually the individual is responding to a quality rather than a quantity change; e.g., indicating how much seeing wildlife would add to a backpacking trip.[3]

For this survey, researchers from the State of Idaho chose an "iterative" bidding game approach implemented by means of a telephone interview. The iterative technique involved repeatedly asking if the respondent would pay successively higher and higher amounts of money. Once the maximum amount that individual would pay was determined, that final value was recorded.

Contingent valuation was first used by Davis (1964). A questionnaire must be designed to present individuals with a well-defined good so that all individuals are responding to the same situation if bids are to be aggregated across participants. Also, if respondents are not fully aware of current conditions or the ramifications of a proposed change, the resulting bids are unreliable. Because hunting is an activity familiar to participants, clearly defining the good is less difficult. However, the

[3] *See Bradford (1970) or Brookshire et al. (1980) for a complete discussion.*

survey should explicitly state the area of hunting affected, i.e., value associated with a particular site with all other sites still available, not value of all waterfowl hunting in the state.

Another aspect of survey design is to identify the appropriate "payment vehicle." That is, what payment mechanism is going to be used to elicit the money bid. Possible payment vehicles include entrance fees, license fees, taxes, trip costs, or payment into a special fund. In this study, trip cost was used as the payment vehicle since it is fairly neutral and familiar to the respondents; also, it is not likely to elicit a protest bid.

One advantage of CVM is the ability to determine willingness to pay not only for current conditions but also for hypothetical changes in hunting quality. In this study additional willingness to pay for doubling the number of opportunities to shoot at waterfowl (versus the current level) was elicited. Opportunities to shoot was used instead of animals taken because an upper bound would have been imposed by the bag limitation set by the USDI Fish and Wildlife Service. This hypothetical question can provide important management information. The value of additional hunting opportunities at a site can be used in determining the cost effectiveness of increasing waterfowl populations and improving hunting conditions.

Another advantage of CVM over TCM is that the value per day associated with hunting on trips that were multipurpose or multidestination can still be estimated. With TCM, one can accurately value only trips for which the primary purpose and primary destination were for hunting. Thus, in this study we will be able to present the value of waterfowl hunting for both primary and non-primary purpose trips.

The analysis of CVM results is often straightforward. Generally the mean willingness to pay is calculated once outliers and protest bids are removed. Screening for outliers involves a case-by-case analysis of very high bids and judgment as to their validity. Devousges et al. (1983) describe a procedure for identifying outliers; however, it relies on incorporating income into a regression model. Since this analysis incorporated secondary income information, such a test was not possible.

As indicated above, questionnaire design is vital to obtaining a true CVM measure of value. While CVM relies on responses to hypothetical questions, research by Bishop and Heberlein (1979) and Brookshire et al. (1982) indicates that rather than an overstatement of willingness to pay, CVM generally provides conservative estimates.

SURVEY DESIGN AND IMPLEMENTATION

The sampling population for this study was hunters having an Idaho small game hunting license or hunting and fishing license in 1982. The random sample population of interest included resident and nonresident hunters. The sampling rate was 0.59% or 1,479 individuals for all upland game and waterfowl.

The 1,479 hunters were first mailed a letter of introduction which included a map of the hunting areas (fig. 1) to assist them in determining the locations or sites they had visited during 1982. The actual telephone survey was conducted during the month of April 1983 by personnel at the University of Idaho.[4] (See the appendix for the complete survey.)

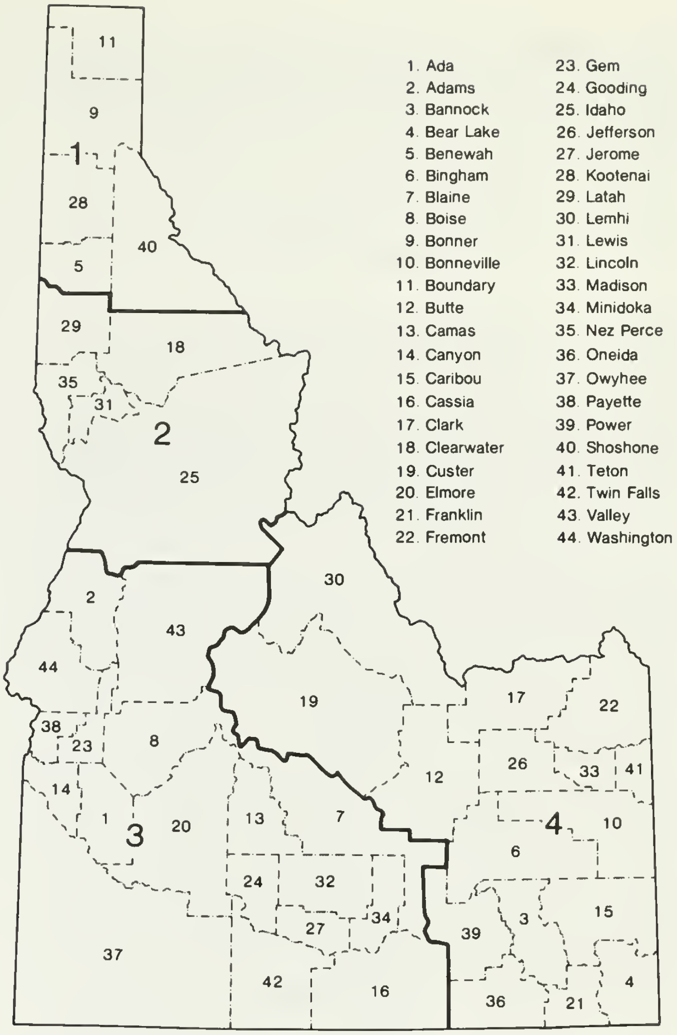

Figure 1.—Waterfowl hunting areas, indicated with county boundary lines.

The survey was designed to collect trip information, party size, hunting quality, and upland game species sought. The data were screened for the Travel Cost Model analysis to insure that hunting was the primary purpose and that visitation of that particular site was the primary destination of the trip. The CVM bidding questions were asked with regard to the last trip to estimate the value of this trip regardless of whether its primary purpose was hunting. The bids are reported separately for primary and non-primary purpose trips.

The respondents were asked to report the round-trip distance traveled to each site that was visited. This variable became the price variable for the TCM analysis. The number of days of hunting on the trip and the number of hours of hunting per day were also elicited from the respondent. This information was used to convert CVM and TCM per trip values to dollar values per day and to a 12-hour Wildlife and Fish User Day (WFUD) as required for USDA Forest Service analyses.

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[4] *The combination mail and phone survey was developed by Lou Nelson and Lloyd Oldenburg of the Idaho Department of Fish and Game. The survey was revised using feedback provided by John Hof, Thomas Hoekstra, Terry Raettig, Wendall Beardsley, and Cindy Sorg of the USDA Forest Service and John Loomis of the U.S. Fish and Wildlife Service.*

STATISTICAL ANALYSIS

Travel Cost Method

The TCM analysis progressed in the following manner. To be able to derive visits per capita, the individual cases were grouped according to counties or in some cases county groups. Within the State of Idaho and bordering counties, county level specification was used. For bordering states with nonbordering counties, county groups were developed. Beyond this level, state and state groups were specified. By dividing population into trips for a state or county group, trips per capita from each group of visitor origin could be calculated. Once the data were aggregated, measures of substitute site attractiveness and site quality were calculated. Measures of site quality and substitute sites were limited to data contained in the survey and harvest data supplied in the harvest report.

Several site quality measures were formulated to reflect hunting quality.[5] The variable sum of opportunities to shoot was significant in the regression analysis, the hypothesis being that the more opportunities to shoot at an area, the greater the word-of-mouth information on hunting potential and hence the higher the visitation rate. Total opportunities to shoot in an area may be considered a measure of possible success at a site and, therefore, a reflection of quality at a site.

Incorporation of a variable to reflect substitute recreation opportunities followed the basic approach of Knetsch et al. (1976). Their substitute measure reflects the price of substitute sites, quality of substitute sites, and availability of such sites. The price of substitute sites is given by the distance from the origin i to the alternative site k. The quality of substitutes is approximated in this study by the total opportunities to shoot at the alternative sites, k. A substitute harvest at alternative site k is found by dividing quality at site k by distance from origin i to site k. This ratio is essentially a measure of the cost effectiveness of site k to recreationists in origin i. Specifically, the ratio can be thought of as opportunities to shoot per mile of driving. Any site k having opportunities to shoot per mile greater than the opportunities to shoot per mile of the site under study, becomes a cost-effective substitute. To account for the degree of availability of these substitutes for a given origin-site combination, the substitute index is the sum of these substitute ratios for all alternative site k's having a ratio greater than the ratio for origin i/site j. The greater the number of alternative sites that are more cost effective than the site visited (j), the larger this substitute index is for j. The larger the value of the substitute index, other things remaining equal, the lower visits per capita ought to be to site j from origin i. Therefore, one would normally expect a negative sign on the substitute term. Adopting the approach of Mendelsohn and Brown (1983), which relies on the Household Production theory view that observed behavior of visitation traces out an efficient recreation characteristic frontier, sites not actually visited by any persons from a given origin are assumed not to be cost-effective substitutes. This clearly narrows the range of sites possibly considered as substitutes. Whether this narrowing is empirically important cannot be determined without a case study comparing the Mendelsohn and Brown (1983) approach and the full substitute approach.

Mean per capita personal income for county/state groups was also tested as a variable because economic theory indicates income has an influence on purchases of trips to a recreation site. Income and income squared were tested because Martin et al. (1974) found income does not necessarily enter in a linear fashion. For example, as income increases hunting activity may increase; however, further increases in income do not often result in the same proportional increases in hunting. That is, doubling of income does not mean a doubling in the number of hunting trips. The increased income may be spent elsewhere. However, increases in income may allow current nonparticipants to become hunters, thereby increasing overall use.

Regression Analysis

In performing the regression analysis, choices regarding functional form and inclusion of variables became obvious as the analysis progressed. The variables that are consistently insignificant were generally dropped from further consideration. This issue of functional form is not so straightforward. Ziemer et al. (1980), Vaughan and Russell (1982), and Strong (1983) argue that because of the pattern by which trips per capita falls off at greater distances, the natural log of visits per capita is preferred to either a linear or natural log of distance functional form. Their point is that either of the latter two functional forms will predict negative visits for a few high-cost origins. Negative visits are counterintuitive and, thus, the natural log of visits per capita functional form is preferable.

Bowes and Loomis (1980) argue that unequal sizes of population groups require a square root of population weighting factor to avoid heteroskedasticity, thereby improving both benefit and use estimates. Vaughan and Russell (1982) and Strong (1983) show that if the log of visits per capita is chosen as the functional form, heteroskedasticity will be so greatly reduced that weighting by square root of population may be unnecessary.

Both methods were tested in this study. A judgment criterion involved comparing estimated visits to actual visits. If estimated visits were fairly close to actual visits, the natural log of visits per capita was adopted rather than Bowes-Loomis weighting, which provides exact use estimation. The settlement of this trade-off depends on whether use or benefit estimation is the critical factor of the study objective. In this study, benefit estimation was most critical.

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[5] *Those site quality variables tested in regression analysis included sum of opportunities to shoot, mean number of opportunities to shoot, total opportunities to shoot per day, average number of days hunted, and average number of hours hunted.*

Calculation of TCM Benefits

To calculate benefits with distance as the price variable using the second stage demand curve approach, distance must be converted to dollars. Travel costs to a site consist of transportation costs and travel time costs. Travel time is included because, other things remaining equal, the longer it takes to get to a site, the fewer visits made. That is, time, because it is often a limiting factor, acts as a deterrent to visiting more distant sites. Omission of travel time will bias the benefit estimates downward (Cesario and Knetsch 1970, Wilman 1980).

The value of travel time was set at one-third of the wage rate (U.S. Water Resources Council 1979, 1983). This is the mid-point of values of travel time that Cesario (1976) found in his review of the transportation planning literature. It must be kept in mind that the use of one-third the wage rate is not necessarily intended to measure wages forgone during the time spent traveling, but rather the deterrent effect of scarce time on which hunt units to visit. Because direct estimates of hunter income were not collected, in this study the U.S. Department of Labor's estimate of median wage of $8.00 per hour was used. One-third of this is $2.67 per hour, or an average of about $0.67 per mile.

Round-trip mileage was converted to transportation costs based on standard costs and on reported costs. First, mileage was converted to transportation cost on a per vehicle basis, using the variable automobile costs from the U.S. Department of Transportation (1982). An intermediate-size car class was taken as typical, at a cost of $0.135 per mile in 1982. With approximately 2.4 hunters per vehicle this standard cost per person was approximately $0.06 per mile. A mileage figure for pickup trucks was not reported.

The transportation cost was also estimated using the respondents' reported cost per mile rather than the standard cost per mile of $0.135. Respondents' reported trip transportation costs, when divided by round-trip distance, equaled approximately $0.11 per mile per hunter. This may be a more appropriate value to use because it reflects the price perceived by respondents. That is, the quantity of trips consumed would probably be more closely related to the perceived cost rather than some standardized cost. Additionally, the Department of Transportation figure used reflects costs of suburban driving with an intermediate-size car. Waterfowl hunting may often involve use of a four-wheel-drive pickup, often with a camper shell, on roads that would rarely resemble suburban roads. These considerations would raise the transportation costs above that of an intermediate-size car. Increasing the transportation cost per mile from $0.06 to $0.11 increases total travel cost, including travel time, to approximately $0.18. The net effect is to now associate the quantity of trips made with a higher price per trip, which translates into a rightward shift in the upper portion of the second stage demand schedule. This shift results in an increase in total and, therefore, per trip consumer surplus. To provide the most useful information for valuation of Idaho waterfowl hunting and to allow comparison to other studies, net willingness to pay is calculated and presented in the results using both standardized and reported cost. For a given increment in distance or added miles, the transportation cost and value of travel time for the amount of time required to travel that distance increment is added together. This rescales the vertical axis of the second stage demand curve from miles to dollars. The area under the second stage demand curve yields estimated sample consumer surplus. Dividing this by trips yields consumer surplus per trip.

Contingent Value Method

The mean net willingness to pay was calculated once missing values, outliers, and infinite bids were removed. When asked if trip was worth more, 88% indicated yes. Although any bid above $100.00 was screened as a possible outlier, no such bids were actually excluded from analysis.

Primary and non-primary/multidestination trips were separated for calculation of mean bids. This allowed comparison of the primary purpose CVM bids with TCM and also comparison of CVM primary and non-primary purpose bids. In addition, mean bids for doubling opportunities to shoot are reported for both primary and non-primary purpose trips. If this study had collected data on individual income, age, sex, education, and additional measures of hunting preferences, a bid curve, as described by Bradford (1970) and Brookshire et al. (1980), could have been developed to predict bids based on various socioeconomic variables. However, this type of information was not collected. For comparison of TCM to CVM, the mean CVM bid and corresponding confidence intervals are adequate.

RESULTS AND DISCUSSION

Table 1 presents a summary profile of the data collected in the hunter survey for the TCM and CVM analyses. These values will be used in discussions and tables throughout the remainder of the report to convert net willingness to pay per trip to standard accounting measures such as net willingness to pay per day or per WFUD.

Figure 1 presents a waterfowl hunt unit map that shows the location of each hunt unit. This map will prove useful when differentiating values across units. For example, accessibility of a particular area may be reflected by the value reported.

Travel Cost Method

As discussed earlier, choice of functional form of the per capita demand equation was related to how well the log of visits per capita reduced heteroskedasticity. The weighted regression equation resulted in neither substitutes nor quality measures being statistically significant. The log of visits per capita did minimize heteroskedasticity to the extent that estimated visits to the hunting units were 2,677 while actual visits were 1,843. For benefit

Table 1—Waterfowl hunter profile

	TCM		CVM[1]	
	Mean	Sample size	Mean	Sample size
Number of days hunting per trip	1.15	295	1.04	183
Number of hours hunting per day	4.52	295	4.43	183
Number of opportunities to shoot per day	8.29	295	9.45	161
Number of licensed hunters per vehicle	2.41	295	2.43	187
Cost of travel per trip	—	-	$30.38	183
Cost of food, ammunition, etc., per trip	—	-	$ 7.83	183
Cost of accommodations per trip	—	-	$39.00[2]	2
Overall cost per trip	—	-	$38.75	183

[1] *Coefficients shown for the contingent value survey represent primary destination/purpose trips to allow comparability between CVM and TCM values.*

[2] *Only those using the service entered into calculation of the mean.*

estimation, this was deemed acceptable. For building a Regional Travel Cost Model for valuation of different hunt areas, it may be more important that quality and substitute variables be present in the equation rather than to sacrifice them to improve the use estimate.

The regression equation used to calculate benefits for waterfowl hunting is given in equation [2]:

$$\begin{array}{llll} \text{Ln(TRPCAP)} = -7.83 & - \; 0.0055\text{DIST} & + \; 0.0015\text{SHOTS} & \\ \text{“t” statistics} \quad (-32.79) & \quad (-3.35) & \quad (3.28) & [2] \\ & -0.0095\text{SUB} & & \\ & \quad (-2.85) & & \end{array}$$

where

TRPCAP = total trips per capita

DIST = round-trip distance in miles

SHOTS = sum of opportunities to shoot

SUB = sum of greater ratios of total opportunities to shoot for a unit divided by distance to all other units.

This equation is significant overall with an F-value of 13.09 and an R^2 value of 0.29. The t statistics indicate significant variables; however, the R^2 value is low, suggesting overall fit is not strong. In addition, an important theoretical variable, income, is not included in the regression equation because of its effect on distance's upper confidence interval. Not including income may account for poor overall fit.

The model specified in equation [2] is termed log-linear because the dependent variable is transformed as shown and the independent variable associated with cost, i.e. distance, is not transformed.

The resulting per capita demand curve was used to derive a second stage demand curve for each waterfowl hunting unit, calculated for each hunt unit using quality and substitute. Successive 50-mile increments were added to the distance variable for each unit until visits per capita from a particular origin were reduced to 0.1. This per capita limit was used as a cut-off because, with natural log of visits, per capita visits would never drop to zero (Wennergren 1967, Smith and Kopp 1980). This generally yields a conservative estimate of the surplus because it cuts off a portion of consumer surplus; however, in this application no consumer surplus was lost.

Table 2 reports average TCM values over all hunting units. These values represent the average value for a waterfowl hunting trip to an average unit in the state, not the average value for waterfowl hunting in the state as a whole, (i.e., the value of a trip to an average unit with all other units available). Because the R^2 was low and an income variable was not included, caution should be exercised when using any of the TCM site values.

Contingent Value Method

Primary Purpose Trips

Table 3 reports average CVM values over all hunt units. Dollar values reflect the mean willingness to pay for current condition and double opportunities to shoot. For primary purpose trips, waterfowl hunters are willing to pay $16.87 per trip more than their current expenses rather than not visit this site. The bids per trip increased from $16.87 to $24.65 if opportunities to shoot doubled.

This information can be useful for waterfowl management, e.g., to weigh the benefits and costs of wetland management or pond restoration. If an area could be managed so that stopover waterfowl populations doubled, then the cost of such actions could be compared to the benefits derived. It should be noted that these values are only a measure of benefits to current users. No measure of new users or increased hunting by current users is given.

Multiple Purpose Trips

Non-primary purpose trips could not be analyzed using the Travel Cost Method because it would be incorrect to attribute the distance driven to the site as an indirect measure of price paid for waterfowl hunting. About 4% of waterfowl hunters visiting these Idaho sites were on non-primary purpose trips. The net willingness to pay for non-primary purpose waterfowl hunting trips was $1.67 per trip (table 3). This translates to $1.67 per day and to $6.32 per 12-hour WFUD. Considering only primary purpose benefits would ignore a portion of total benefits.

Table 2—Average waterfowl hunting values derived by the Travel Cost Method

	Standard cost per mile[1]	Reported cost per mile[2]
Net willingness to pay per trip for current conditions	$22.25[3]	$32.79[4]
Number of days hunting per trip	1.15	1.15
Net willingness to pay per day for current conditions	$19.35	$28.51
Number of hours hunting per day	4.52	4.52
Net willingness to pay per WFUD	$51.37	$75.69

[1] *Standard cost per mile of $0.135.*

[2] *Reported cost per mile of $0.273.*

[3] *95% sensitivity interval: $14.16 to $54.13.*

[4] *95% sensitivity interval: $20.88 to $79.65.*

Table 3—Average waterfowl hunting values derived by the Contingent Value Method

	Primary purpose		Non-primary purpose	
	Mean	Sample size	Mean	Sample size
Net willingness to pay per trip for current conditions	$16.87[1]	183	$1.67	6
Number of days hunting per trip	1.04	183	1.0	6
Net willingness to pay per day for current conditions	$12.05	-	$1.67	-
Number of hours hunting per day	4.43	183	3.17	6
Net willingness to pay per WFUD for current conditions	$32.64	-	$6.32	-
Number of opportunities to shoot per day	9.48	160	4.00	3
Net willingness to pay per trip	$24.65	183	$2.17	6

[1] *95% confidence interval: $11.14 to $22.60.*

Regional Groupings

The individual hunting areas were aggregated into groups because of the small sample size, and the net economic values are presented on the basis of regional groupings (as shown in fig. 1) instead of hunting areas. Table 4 presents the TCM and CVM values by regional group for net willingness to pay per trip for waterfowl hunting. Values for reported cost TCM range from $26.41 for region 2 to $34.06 for region 4. The high value for region 4 may reflect the easy accessibility from populated areas and low travel costs. CVM values range from $10.60 for region 2 to $21.22 for region 4.

Comparison of TCM and CVM Values

The appropriate CVM values to compare to TCM values are CVM values for primary purpose trips. The CVM values are generally lower than TCM values for waterfowl hunting in Idaho, possibly because the CVM bids are for the hunters' last trip whereas the TCM applies to all trips taken that year. If the last waterfowl hunting trip is not quite typical of all trips taken, the values would differ for legitimate reasons. Unlike big game hunting, which has a very short season and a bag limit of one animal, numerous waterfowl hunting trips can be taken during the fall/winter season. Thus, the last trip of the year may be worth less at the margin than the first trip of the year. Because CVM is based on this last trip, it may reflect a marginal value to the individual that could be below the average consumer surplus over all trips.[6] Conversely, the TCM values were estimated using a regression equation with a low R^2 and no income variable; therefore, the TCM values are less reliable than the CVM values.

Use of confidence intervals for CVM and sensitivity intervals for TCM can assist in this comparison of CVM

[6] *Gum, Russell, Richard Adams, and Sue Garifo. 1983. Recreation value as a function of methodology. Paper presented at W-133 meeting, February 18-19, 1983, San Diego, Calif.*

Table 4—Waterfowl hunting valuation[1] by hunt areas regions using the Travel Cost and Contingent Value Methods[2]

	Region 1	Region 2	Region 3	Region 4
Travel Cost Method				
Net willingness to pay for current conditions				
Standard Cost	$20.57	$18.57	$22.31	$22.70
Reported Cost	$29.82	$26.41	$32.76	$34.06
Contingent Value Method				
Net willingness to pay for current conditions	$18.79	$10.60	$14.18	$21.22
Net willingness to pay for double opportunities to shoot	$ 8.84	$11.00	$ 8.07	$ 6.68
CVM Valid Cases	19	5	99	60
Average Total Cost				
Average cost of travel	$ 6.79	$27.60	$ 8.99	$73.70
Average cost of food	$ 8.16	$ 9.40	$ 7.05	$ 9.20
Average motel cost	0.00	$70.00	$ 8.00	0
Number reporting	0	4	1	0
Number of opportunities to shoot per day	13.17	6.40	7.94	10.89
Number of hunters	2.63	2.20	2.43	2.37
Number of days hunting	1.00	1.20	1.01	1.06
Number of hours hunting per day	5.82	3.40	4.41	4.13

[1] *Per trip values unless otherwise specified.*

[2] *Hunt area regions include the following counties (see fig. 1):*

Region 1 — 5, 9, 11, 28, 40

2 — 18, 25, 29, 31, 35

3 — 1, 2, 7, 8, 13, 14, 16, 20, 23, 24, 27, 32, 34, 37, 38, 42, 43, 44

4 — 3, 4, 6, 10, 12, 15, 17, 19, 21, 22, 26, 30, 33, 36, 39, 41.

and TCM values, as shown in figure 2. For this comparison to be valid, the primary purpose CVM values are used. The CVM value per trip is $16.87, with a 95% confidence interval of $11.14 to $22.60. The standard cost TCM value is $22.25 per trip, with a 95% sensitivity interval of $14.16 to $54.13 per trip. The reported cost TCM value is $32.79, with a 95% sensitivity interval of $20.88 to $79.65. This sensitivity interval indicates the CVM value is lower than the reported cost TCM value.

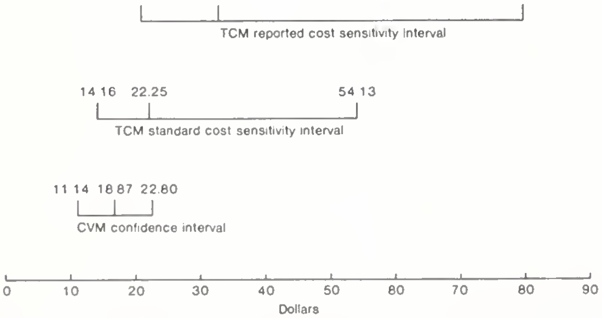

Figure 2.—Comparison of confidence intervals for CVM to sensitivity intervals.

Comparison to Other Waterfowl Studies

Hammack and Brown (1972) used CVM to derive a value for waterfowl hunting in the Pacific Flyway. The study used a noniterative, open-ended mail questionnaire. Respondents were asked willingness to pay additional costs during the entire waterfowl season. A value of $256.00 per hunter is reported. A hunter spends an average of 10.5 days afield during the season, resulting in a value of $25.00 per day or $61.00 in 1982 dollars. This value is higher than the TCM reported cost value but falls within the sensitivity interval. Both studies reflect an entire season of waterfowl hunting.

Hansen[7] used CVM to derive a value for an area encompassing Idaho, Utah, Nevada, and western Wyoming using data from the 1975 U.S. Fish and Wildlife Service Hunting and Fishing Survey. The mail survey was noniterative and open-ended. A value of $20.12 per visitor day is reported. In 1982 terms, the value is $32.00. This value is nearly identical to the reported cost TCM value.

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[7] *Hansen, Christopher. 1977. A report on the value of wildlife. 28 p. Intermountain Region USDA Forest Service, Ogden, Utah. Dec. 1.*

Goose hunting in Wisconsin was valued by Bishop and Heberlein (1980) using several methodologies. Each method, however, derived a value for a goose hunting permit that, in effect, values an entire season. A value of $63 represents the average cash payment accepted to give up a goose hunting permit. The format involved checks from $1 to $200 sent to current holders of permits. They could either accept the check and give up the permit or vice versa. A different sample was asked hypothetical willingness to pay additional money for a permit. The survey format was an open-ended mail questionnaire. This resulted in an average net willingness to pay of $21.00 per permit. A third sample was asked questions that allowed implementing the zonal TCM. The TCM results ranged from $7.00 per permit when no adjustment was made for travel time to $32.00 per permit when travel time was valued at one-half the wage rate. Updating to 1982 results in values of $84.73, $28.24, and $41.66 for cash, CVM, and one-fourth wage rate TCM, respectively. The CVM and one-fourth wage rate TCM values fall within the 95% sensitivity interval for reported cost TCM.

Application

To evaluate multiple-use efficiency trade-offs between timber, cattle grazing and waterfowl habitat, the net economic value should be utilized. As a simple example, suppose the wildlife biologist estimates that stopover waterfowl populations would double if wetland drainage were reduced in a portion of the state, thus supplying more waterfowl habitat. The biologist, recreation planner, and economist could then translate this doubling in stopover waterfowl populations to an increase in waterfowl available for harvest. Once the increase in waterfowl available for harvest is known, the theoretically correct way to calculate the additional long-run benefits of this change is to use this new level of available harvest as a demand curve shifter. When waterfowl harvest goes up, the demand increases. This can be seen in figure 3 as the shift from D_1 to D_2. The increase in quantity of waterfowl available for harvest will be translated (in TCM) into existing hunters taking more trips and the non-hunters entering (or reentering) to become hunters because of the increase in waterfowl populations. The theoretically correct benefits of these additional 500 trips is equal to the shaded area between the demand curves. This value is a long-run value because it allows for entry of new hunters in response to the increase in waterfowl.

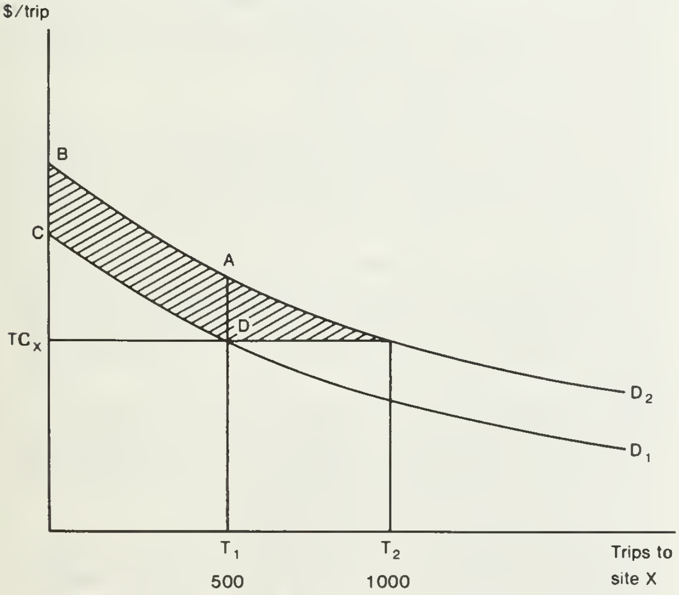

Figure 3.—Site demand curve for waterfowl hunting.

In field studies it is often difficult for biologists to have access to the original data, per capita demand curves for each site, and a program to calculate benefits with quantity-induced demand shifts. Often the biologist will be able to translate the population change into an increase in supply of hunting trips. The economic benefit of the added trips that there is a demand for can be approximated by multiplying the increase in trips by the average net value per trip. For figure 3, suppose there are an additional 500 waterfowl hunting trips per year. This 500 waterfowl trips times $32.79 per trip would yield annual benefits of $16,400. This would be compared to the economic costs of restricting wetland drainage. These costs may take the form of enforcement costs, alternative areas for drainage, and the net economic value of the land no longer available for development.

If the hunters' net willingness to pay (as revealed hypothetically by the $16,400) for the additional hunting trips is greater than the developers' net willingness to pay for the land, economic efficiency is improved by restricting wetland drainage, assuming this allocation of resource meets a suitable equity criterion.

Benefits of increased stopover waterfowl populations do not necessarily flow only from more hunter days. In the short run an increase in harvestable waterfowl may be of benefit to current hunters only. To estimate the increase in value to current users, we rely on CVM questions asked in the survey. By increasing waterfowl populations, the demand curve for the waterfowl resource shifts up to the right, leading to a higher value per day. These added benefits or marginal benefits can be calculated by taking the area between these two demand curves, holding numbers of trips constant. Such increases in value per trip were obtained directly from CVM. In this study we found the value per trip would rise by $24.65 if the number of opportunities to shoot doubled. In terms of figure 3, the benefits being calculated here represent just the area between the demand curves for the current 500 trips (area ABCA). Continuing the example, if when waterfowl populations double, the number of opportunities to shoot by existing hunters also doubles, then the CVM values can be used to calculate the area ABCD. Doubling the number of opportunities to shoot, would, according to the CVM results, increase the value of the existing 500 trips by about $25.00 per trip. This results in an increased value of $12,500 for doubling the number of opportunities to shoot for existing hunters, which is slightly less than the total long-run benefits when existing hunters take more trips and new hunters begin to hunt.

These added values can be useful in evaluating changes in waterfowl harvest regulations (within federal regulations) or resource actions that will change the total number of waterfowl harvested or the type of waterfowl harvested. Decisions made by integrating the economic values into project analyses of timber sales, wetland drainage management, right-of-way design, and habitat restoration investments are likely to result in increases in net public benefits as compared to current undervaluation of waterfowl hunting values.

CONCLUSIONS AND RECOMMENDATIONS

Both the Travel Cost and Contingent Value Methods had advantages and disadvantages in this study. The advantages of CVM include the ability to value not only primary purpose-primary destination trips but also secondary purpose or multidestination trips, the ability to value double opportunities to shoot, and the ease of data analysis. For waterfowl hunting, multidestination trips represent more than 4% of total trips. Most respondents were willing to participate in the bidding game. The only limitation of CVM was that it could reasonably be applied only to the last trip taken, because applying the bidding sequence to each trip would have increased the length of the interview, making obtaining an adequate sample costly and time consuming.

The primary advantages of TCM relate to its reliance on actual behavior and applicability to all trips taken during the season. TCM has the advantage of being able to predict how many additional trips (or with some additional calculation, hunters) there would be if the number of opportunities to shoot doubled. The disadvantages of TCM relate to inability to value multipurpose or multidestination trips, selection of a value for travel time, and the time required to construct a Regional Travel Cost Model.

In summary, if a survey must be performed to collect data for valuation, CVM is faster in terms of data compilation and statistical analysis. However, if origin-destination information already exists in the form of permits or license plate numbers, etc., then TCM would become a more cost-effective way to value recreation activities. No method is superior in all cases; both yield fairly consistent, although not identical, results.

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APPENDIX

Marginal and Average Consumer Surplus—Conditions of Equality

The objective of the proof is to show that average benefits are equal to marginal benefits in relation to the per capita (stage I) demand curve. The means to accomplish this is to derive the mathematical expression for the benefits in each case and to show these are equal. The conditions under which this is true are:

1. Demand relationships between visits per capita and price (cost of travel) can be validly modeled with a semi-log functional form such as

$$\ln(q) = a - bp \qquad [A1]$$

or equivalently,

$$q = e^{a-bp} \qquad [A2]$$

where q is quantity, in this case, visits per capita
p is price, in this case, travel cost
a is the intercept parameter
b is the slope parameter

2. The only shifting variables allowed in the equation affect the intercept. No slope shifting variables are in the equation.
3. A slight relaxation of condition 2 occurs if there are slope shifting variables but they do not change from the "before" to the "after" states.
4. Each origin is a price taker in that people from that origin may visit the site as many times as they desire at their current travel cost. Therefore, the supply curve facing a given origin is horizontal. Due to differences in location from the site, each origin faces a different horizontal supply curve.

The "Before" State

Figure A-1 shows the overall scope of the changes considered in the proof. At equilibrium in state 1, i.e., the "before" state, the demand curve has a quantity intercept of e^{a_1} when price is zero. As price increases, quantity decreases and asymptotically approaches zero for very large p. For a price of p_1, visits per capita to a site from a specific origin are q_1.

Total benefits per capita that accrue to the presence of the site, given all other existing sites, are represented by the shaded area labeled CS_1 (consumer surplus in state 1). This area is found by integrating under the demand curve and above the price line p_1.

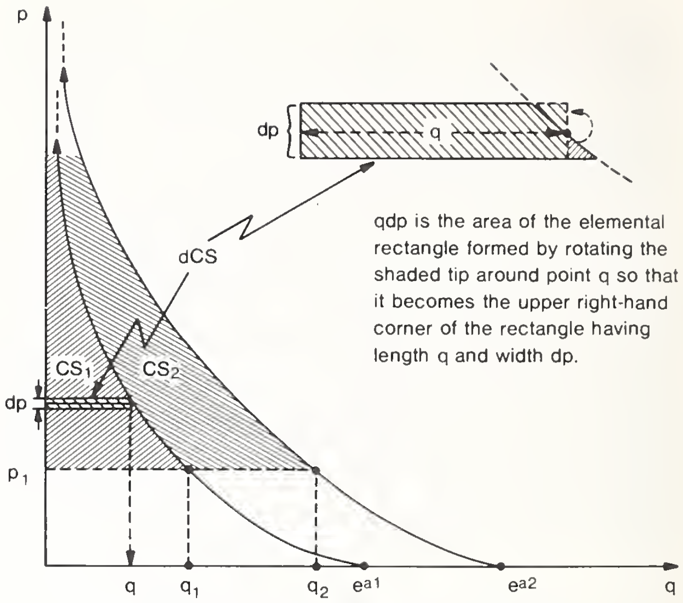
Let a small segment of the area, dCS, be

$$dCS = q\, dp \qquad [A3]$$

as shown in figure x.

Then

$$CS = dCS = \int_{p_i}^{p} q\, dp \qquad [A4]$$



qdp is the area of the elemental rectangle formed by rotating the shaded tip around point q so that it becomes the upper right-hand corner of the rectangle having length q and width dp.

Figure A-1.—Changes in consumer surplus.

The limits of integration define the lower boundary of the CS area, the p_1 price line, and the upper boundary of the CS area, the point where p goes to infinity and q goes to zero. In spite of these extreme values, it turns out the CS area is finite.

Substitute for q from equation [A2] in the integral in equation [A4] giving

$$CS_1 = \int_{p_i}^{p} e^{a_1 - b_1 p}\, dp \qquad [A5]$$

where the subscript 1 denotes state one ("before"). Continuing with the integration gives

$$CS_1 = e^{a_1} \int_{p_1}^{p} e^{-b_1 p} dp = -\frac{1}{b_1} e^{a_1 - b_1 p} \Big]_{p_1}^{p} \qquad [A6]$$

Evaluating the expression in [A6] at the limits of integration gives

$$CS = - \left(\frac{1}{b_1} e^{a_1 - b_1 p} \right) - \left(- \frac{1}{b_1} e^{a_1 - b_1 p_1} \right) \qquad [A7]$$

$$CS_1 = \frac{1}{b_1} \left(e^{a_1 - b_1 o_1} - e^{a_1 - b_1 p} \right) \qquad [A8]$$

In order to include the entire area under the demand curve, let p (not p_1) become infinitely large, (→∝). For large p

$$e^{a_1 - b_1 p} = q \rightarrow 0 \qquad [A9]$$

so that the expression for CS in [A8] becomes

$$CS_1 = \frac{1}{b_1} \left(e^{a_{21} - b_1 p_1} \right) = \frac{q_1}{b_1} \qquad [A10]$$

Average consumer surplus in state one per trip made (q_1) is

$$\overline{CS}_1 = \frac{CS_1}{q_1} = \frac{1}{b_1}\left(e^{a_1 - b_1 p_1}\right)\frac{1}{q_1} \qquad [A11]$$

But $e^{a_1 - b_1 p_1}$ is q_1, so [A12]

$$CS_1 = \frac{1}{b_1}$$

Thus, average consumer surplus per trip in state one, the "before" state, is simply the inverse of the slope parameter from the demand equation, assuming the conditions previously stated are met.

The "After" State

Now assume that managers of the recreational sites under consideration wish to increase the attractiveness of the specific site, for example, by increasing the number of animals or fish potentially harvestable. This new condition becomes the "after" state.

The new attractiveness at the site increases the intercept to e^{a_2}, but does not affect the slope coefficient b, as we have assumed, so $b_1 = b_2 = b$, (i.e., quality is an intercept shifter only). Using the result of the previous section, that, in general under the stated conditions,

$$CS = \frac{1}{b}\left(e^{a-bp}\right) = \frac{q}{b} \qquad [A13]$$

and placing the subscript (2) for the "after" state on the variables, total per capita consumer surplus for the "after" state is

$$CS_2 = \frac{1}{b_2}\left(e^{a_2 - b_2 p}\right) = \frac{q_2}{b_2} \qquad [A14]$$

Note that "after" average CS is also $\frac{1}{b_2} = \frac{1}{b}$.

The total change in consumer surplus from the "before" to the "after" state is

$$\Delta\, CS = CS_2\ CS_1 \qquad [A15]$$

$$\Delta\, CS = \frac{q_1}{b_2} - \frac{q_2}{b_1} \qquad [A16]$$

But, as noted, $b_2 = b_1 = b$, so

$$\Delta\, CS = \frac{q_2 - q_1}{b} \qquad [A17]$$

The marginal change per unit increase in trips is defined as

$$\frac{\Delta CS}{\Delta q} = \frac{\frac{q_2 2_1}{b}}{q_2 - q_1} \qquad [A18]$$

So

$$\frac{\Delta CS}{\Delta q} = \frac{1}{b} \qquad [A19]$$

And since $b = b_1 = b_2$, combine the results of the derivation of "before" average consumer surplus and the derivation of the marginal consumer surplus caused by the change to the "after" state.

Thus,

$$\overline{CS}_1 = \frac{1}{b} = \frac{\Delta CS}{\Delta q} = CS_{marg} = \overline{CS}_2 \qquad [A20]$$

and the proof is complete given that the preceding conditions are met.

Note in the proof that the relationship in equation [A20] does not depend on the price level even though figure x shows price unchanging. Neither do the key equations for "before" and "after" consumer surplus, equation [A10] and [A14], respectively. Under the stated conditions, there may or may not be a price change along with the demand curve shift. Regardless, it does not affect the equality between the "before" average consumer surplus and the "before" - to - "after" marginal change in consumer surplus. Moreover, the price may change in either direction without affecting the results.

Therefore, with this functional form multiplying the average consumer surplus of a trip or WFUD by the change in trips or WFUDs due to one of the three factors discussed above will result in an exact estimate of the area between the demand curve associated with that change in trips or WFUDs. This is a result specific to this functional form. Therefore, if the field analyst has an idea of change in trips associated with some management action, the analyst can calculate an estimate of the change in economic efficiency benefits associated with that change in days without having to shift the second stage demand curve.

Sensitivity Intervals

The statistical properties of the estimators of such variation are as yet undefined and the problem is theoretically difficult. In spite of this situation, certain aspects of sensitivity may reveal information about the variability of benefit estimates. Specifically, for this research, a so-called sensitivity interval was defined. This interval is for estimated benefits measured by willingness to pay and describes what are the upper and lower bounds of the benefit estimate when the regression coefficient of distance is varied to the upper and lower bounds of its confidence interval.

For example, the computer program that computes benefits is run three times, once with the distance coefficient at its best unbiased level, once with it at the lower level of its 95% confidence interval, and once with the distance coefficient at the upper level of its 95% confidence interval.

These three estimates of benefits related to waterfowl hunting indicate how benefits vary with respect to variation in the coefficient associated with distance. Distance is chosen specifically because increased increments of this independent variable measure additional cost hypothetically incurred by hunters. In this bulletin these sensitivity intervals are compared to the confidence intervals derived from the Contingent Valuation Method. This comparison is not a statistical procedure per se, but it does provide a quantitative measure of the relative ranges in estimates produced from each method.

Script for Telephone Interview of Idaho Waterfowl Hunters

INTRODUCTION

Hello, Is this the residence of ______________________________?
first and last name

If yes. If no, → the number I was calling is ______________________________
telephone number

and I am trying to contact ______________________________ , sorry I bothered you. (terminate, check name and number.)

→ this is ______________________________ at the University of Idaho. I
interviewer's name

am calling for the college of forestry, wildlife and range sciences in moscow. We are doing a study of waterfowl hunting in Idaho. ______________ 's Name was given to us by the Idaho department of fish and
first and last name

game. Is he/she there? may I speak to him/her?

1. *Respondent is on the phone*
2. *Respondent is called to phone*
3. *no*

→ When may I call back to reach him/her? ______________ and
date

______ a.m./p.m. would you tell him/her that I called
time

and that I will call back. thank you.

→ This is ______________________________ at the University of Idaho. I am calling for the college of
interviewer's name

forestry, wildlife and range sciences in moscow. we are doing a study of Waterfowl hunting in Idaho. Your name was obtained from the Idaho department of fish and game's lists of license holders.

→ Last week we sent you a letter and map that explained a little about our study. did you receive it?

yes

no → I am sorry yours did not reach you. it was a brief letter we sent so that people would know we would be calling them.

→ 1. Did you hunt waterfowl in Idaho during 1982?

no → Thank you for your help. That is all the questions that I have for you.

yes

→ (skip this question if they did not receive the letter).

2. Did you have time to list all the hunting trips you took during 1982 on the map we sent you?

yes → Would you read me the list of counties in which you hunted.

RECORD LIST ON SEPARATE SHEET

no

On a piece of paper, preferably the one we sent to you in the mail, list all the waterfowl hunting trips you took this past season. A list of counties is fine. our goal is not to find out your special spots. Please take a moment to make your list of hunting areas and corresponding map units. If you went to one area more than once, just list the area and number of trips. List trips for different types of game separately.

Pause while he/she completes the list. Try to get them to make their own list. You may write the list if they do not have paper or refuse to write it out.

Would you read me your list of hunting trips.

Note 1. *It is your responsibility to get enough information to assign a map unit number to each hunting area.*

Note 2. Probe: Did you include trips you took with your family, visiting relatives, friends, or people you work with?

Now that we know how many trips and in what map unit you took them, i would like to ask you some more detailed questions about each trip. if you made more than one trip to an area, please give the average for those trips.

was the primary purpose of your trip to ______________________ to hunt waterfowl?
general area

yes

no → (terminate and start new area)

maybe → Would you have visited this area if waterfowl hunting was not available?

yes → (terminate and start new area)

no

→ Was this area the primary destination of this trip?

yes → (enter A "1")

no

maybe → Would you have made this trip if you could not have visited the area?

no

→ yes → How many destinations did you have on this trip?

__________ areas

What were those destinations?

→ How many trips did you make to ______________________________________

general area

__________ trips

Did you drive the entire distance to ______________________________________?

general area

yes → mode = 1

no → What different types of transportation did you use?

small plane, airline, horse, car, jet boat, etc.

For your trip to ______________________________, what was the approximate

general area

total distance you traveled? ______ miles

Counting yourself, how many licensed hunters went in your vehicle to

______________________________? __________ hunters

general area

How many days did you hunt on this trip to ______________________________?

general area

(to nearest half day)

On average, how many hours per day did you hunt?

__________ hours

What was the primary type of game you were trying to bag?

1. *Upland Game (Mixed Bag)*
2. *Cottontail Rabbits*
3. *Pheasant*
4. *Hungarian Partridge*
5. *Chukar*
6. *California Valley Quail*
7. *Other Quail*
8. *Forest Grouse*
9. *Ruffed Grouse*
10. *Blue Grouse*
11. *Prairie Grouse*
12. *Sharptail Grouse*
13. *Sage Grouse*
14. *Turkey*
15. *Doves*

20. *Waterfowl*
21. *Geese*
22. *Ducks*
23. *Coots, others*

30. *Mixed upland & waterfowl*

On average, how many times per day did you see birds within shooting range when you had an opportunity to shoot?

If this is the last area, go on

If there are more areas, go on with other areas

That is all I need about this area. Now I would like to talk about your trips to ______________________.

general area

go back for second area, third area, etc.

Repeat the next set of questions for upland game and waterfowl separately (if both were hunted)

Next, I would like to ask you some questions about your most recent waterfowl hunting trip in 1982. What area did you visit on your most recent trip?

____

area

Was the primary purpose of your trip to ______________________________ to hunt for waterfowl?

general area

yes

no

Was this area the primary destination of this trip?

Record response as follows:

If "Primary purpose?" is

yes *no*

yes	1	1
no	3	4

How many licensed hunters were in your party?
__________________ people

How many days did you hunt on this trip (to nearest half day)?
__________________ days

On average, how many hours did you hunt each day?
__________________ hours

What was the primary type of game you were trying to bag?

1. *Upland Game (Mixed Bag)*
2. *Cottontail Rabbits*
3. *Pheasant*
4. *Hungarian Partridge*
5. *Chukar*
6. *California Valley Quail*
7. *Other Quail*
8. *Forest Grouse*
9. *Ruffed Grouse*
10. *Blue Grouse*
11. *Prairie Grouse*
12. *Sharptail Grouse*
13. *Sage Grouse*
14. *Turkey*
15. *Doves*

20. *Waterfowl*
21. *Geese*
22. *Ducks*
23. *Coots, others*

30. *Mixed upland & waterfowl*

The next few questions concern the amount of money that was your share of the amount spent on this trip. please estimate the amount spent on transportation on this trip.
$ __________________

Please estimate the amount spent on food, ammunition, etc. on this trip.
$ __________________

Now, estimate the amount spent on accomodations on this trip.
$ __________________

Was this trip to ____________________________ worth more than you actually spent?
general area

no → STOP HERE
yes
→ Next, I would like to ask some hypothetical questions about this trip to ____________________________.
general area

assume that the trip became more expensive, perhaps due to increased travel costs or something, but the general waterfowl hunting conditions were unchanged. You indicated that $ __________________ were spent on this trip for your individual use.

Would you pay $ __________________ more than your current cost rather than not be able to hunt for waterfowl
20% of cost
at this area?

PROTEST – WILL NOT ANSWER
RECORD WHY?

1. *it's my right*
2. *my taxes already pay for it*
3. *no extra value*
4. *like to, but not able*
5. *refuse to put a dollar value*

yes
no → *Work between 0 and 20% to find highest acceptable value.*
Split the difference in half until you reach nearest $1
(less than $10) or nearest $5 (greater than $10).
→ Would you pay $ __________________ more than your current cost rather than not be able to hunt for
50% of cost
waterfowl at this area.

yes
no → *Work between 20 and 50% to find highest acceptable value.*
Split the difference in half until you reach nearest $1
(less than $10) or nearest $5 (greater than $10).
→ Would you pay $ __________________ more than your current cost rather than not be able to hunt waterfowl
100% of cost

at this area?

yes

no → *Work between 50 and 100% to find highest acceptable value.*
split the difference in half until you reach nearest $1 (less than $10) or nearest $5 (greater than $10).
Keep going until you receive a negative answer. Use 100$ increments.
Work between last two bids to find highest acceptable value.

→ *After last bid*

Is this amount, $ ____________ (bid), what you personally would pay, not for all members of your party?

no → *repeat bids for personal value*

yes

→ How many times per day did you see birds when you had an opportunity to shoot?

Now, suppose that instead of ____________ opportunities, you could have ____________ opportunities to shoot. How much, if any, would you increase your bid of $ ____________?

$ ____________

That is all the questions I have for you. Thank you for taking the time to answer these questions. Your responses will be very valuable to us.

Goodbye.

Sorg, Cindy F., and Louis J. Nelson. 1987. Net economic value of waterfowl hunting in Idaho. USDA Forest Service Resource Bulletin RM–14, 18 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

Average net willingness to pay for waterfowl hunting in Idaho was estimated at $22.25 per trip and $32.79 per trip, using the Travel Cost Method with a standard cost per mile and a reported cost per mile, respectively. Using the Contingent Value Method, a net value of $16.87 was estimated for the last trip of the season. Willingness to pay was greater for double the number of opportunities to shoot. Methods, results, and applications are fully described.

Keywords: Travel Cost Method, Contingent Value Method, waterfowl hunting, Idaho, economic value, recreation

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U.S. Department of Agriculture
Forest Service

Rocky Mountain Forest and Range Experiment Station

Rocky Mountains

Southwest

Great Plains

The Rocky Mountain Station is one of eight regional experiment stations, plus the Forest Products Laboratory and the Washington Office Staff, that make up the Forest Service research organization.

RESEARCH FOCUS

Research programs at the Rocky Mountain Station are coordinated with area universities and with other institutions. Many studies are conducted on a cooperative basis to accelerate solutions to problems involving range, water, wildlife and fish habitat, human and community development, timber, recreation, protection, and multiresource evaluation.

RESEARCH LOCATIONS

Research Work Units of the Rocky Mountain Station are operated in cooperation with universities in the following cities:

Albuquerque, New Mexico
Flagstaff, Arizona
Fort Collins, Colorado*
Laramie, Wyoming
Lincoln, Nebraska
Rapid City, South Dakota
Tempe, Arizona

*Station Headquarters: 240 W. Prospect St., Fort Collins, CO 80526